

UNIVERSITY OF BAHRAIN
COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE

ITCS 385 – Database Systems

Midterm
Semester I, 2011-2012

Date: Thursday, December 1st, 2011

Time: 2:00pm - 3:30pm

| | |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name | |
| Student I.D. | |
| Section | <div style="display: flex; align-items: center;"><div style="margin-right: 20px;">[1] [2] [3]</div><div><i>Please tick one</i></div></div> |

| | | |
|------------|----|--|
| Question 1 | 15 | |
| Question 2 | 14 | |
| Question 3 | 26 | |
| Question 4 | 15 | |
| Question 5 | 20 | |
| TOTAL | 90 | |

Notes:

1. Your answers must be written on the question paper and in the place allocated. Any answer written on any other place will not be marked.
2. Use the back of the pages for any rough work, BUT remember rough work will not be marked.
3. Do not give more than one answer (alternative solutions) to the same question; if you do so then only the first answer will be marked.
4. **Switch off your mobile** and keep it in your pocket or bag.

Question 1 [5+5+5=15 marks]

1. Define the following terms

DBMS : _____

User View : _____

2. In the past few years, advances in technology have led to new applications of database systems, as in 'Multimedia Database' and 'Geographic Information Systems'. Briefly explain these types of database systems, and show an example of each.

3. 'Self-Describing Nature of a Database system' is one of the main characteristics of the database approach. Briefly, explain this characteristic and show how it differs from traditional file systems.

Question 2 [4+4+6=14 marks]

1. Define the following terms

Data Model: _____

2. DBMS provides a number of user friendly interfaces. List two (2) interfaces suitable for naïve or parametric users.

3. Explain the three-tier DBMS architecture showing the main functionalities of each tier and how this architecture can be used to enhance the security.

Question 3 [26 marks]

Consider the following requirements for a University database that is used to keep records of professors, senior students and senior projects.

In the university, each senior project is identified by a unique project number, and has a name, and the main professor managing the project. Each project also has a potential span, which is recorded as the project potential starting and ending dates. A project may also have co-professor(s) working on the project other than the main professor managing the project. Each professor has a CPR, name, rank, and research specialties. A university professor can manage and/ or work on multiple projects. In addition, the database should keep track of all senior students' records. Each senior student has a CPR, ID, name, age, and date of birth. As soon as a senior student works on a senior project, the starting date is recorded. A senior student can work on only one project but a project could have up to three senior students. A senior student could be assigned to another more senior student (known as student advisor) for general advises in projects and courses in the university.

Design an ERD for this application. Note any unspecified requirements, and make appropriate assumptions to make the specification complete.

Question 4 [3+3+3+3+3=15 marks]

Country

| ID | Name | TelCode |
|----|---------|---------|
| 1 | Bahrain | 00973 |
| 2 | Kuwait | 00965 |

Hotel

| CountryID | Name | Rating | ManagerID |
|-----------|-------------|--------|-----------|
| 1 | Hilton | 5 | 100 |
| 1 | Diplomat | 5 | NULL |
| 2 | Holiday Inn | 4 | 541 |

| Attribute | Format |
|-----------|-------------------------|
| ID | Integer |
| Name | Characters: max size 25 |
| TelCode | 5-digits number |

| Attribute | Format |
|-----------|-------------------------|
| CountryID | Integer |
| Name | Characters: max size 50 |
| Rating | Integer: range 1 to 5 |
| ManagerID | 3-digits number |

Consider the above Relational Database state and dictionary to answer the following questions:

1. Define the alternate key(s) if any for the Country relation? If an alternate key exist, specify the key(s) and provide an explanation.

Answer: (NO alternate key / YES, an alternate key(s) exist)

If YES, Specify and Explain: _____

2. Will *UPDATE Hotel set ManagerID=100 where CountryID= 1;* be successful? If not why?

Answer: (YES / NO)

If NO, WHY _____

3. Will *Delete from Country where ID=2;* be successful? If not why?

Answer: (YES / NO)

If NO, WHY _____

4. Will *insert into Country values (1, 'Oman', '+961')*; be successful? If not why?

Answer: (YES / NO)

If NO, WHY _____

5. List two reasons that could have led to the occurrence of the NULL value in the Hotel relation.

(a) _____

(b) _____

Question 5 [4 + 5 + 5 + 4 + 2] [20 marks]

Consider the following database schema for a company database, in which an employee can work in different departments and a department would have many employees. For each employee working in a given department, the number of working hours per week in this department is recorded. The database schema is given below (primary keys are underlined):

Employee (ID, name, age, salary)

Department (code, name, managerID)

Employment (EmpID, Dcode, HoursPerWeek)

Write the following queries in SQL questions.

1. List the ID, name for all senior employees, i.e. employees 50 years old and above.

SELECT _____

FROM _____

WHERE _____

2. List the ID, name and salary of all managers whose salary is more than 600.

SELECT _____
FROM _____
WHERE _____

3. List the number of employees working in the 'IT' and 'Personnel' departments.

SELECT _____
FROM _____
WHERE _____

4. List the codes of all departments without managers.

SELECT _____
FROM _____
Where _____

5. Write SQL statement to delete the Employment relation.

